Extracting Brain PET-MRI Joint Structures for Statistical Analysis

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Résumé

Within the context of brain image analysis, classical mono-modality analysis could be significantly improved by combining different image modalities.

Indeed, Positron Emission Tomography (PET) and Magnetic Resonance Imaging (MRI) joint analysis bring complementary informations, as PET gives access, for example, to quantitative brain neurotransmission parameters, while MRI good spatial resolution can be used to differentiate between specific brain structures.

The major impediments of brain image statistical analysis are often related to the small number of available samples compared to the large size of the multi-modal images, as well as the image low signal to noise ratio (SNR).
Our aim is to overcome these limitations, by taking advantage of the additional information provided by the different modalities: for instance, functional MRI can provide relevant data decompositions that improve the sensitivity of statistical analyses.

In this presentation, I will present a statistical and classification framework that relied on both modalities, and also preliminary experiments on clinical studies such as the early detection of the Alzheimer's Disease, by using [18F]-FDG PET and resting-state fMRI data from the Alzheimer's Disease Neuroimaging Initiative (ADNI).
The approach takes into account the structure of the multimodal images, and also the patterns that better match the underlying physiopathology.

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